



This document includes Section 7, Overall Summary, and Section 8, References, for the Draft "Hull Coating Leachate" Discharge Assessment Report published in August 2003. The reference number is: EPA-842-D-06-002

DRAFT

Discharge Assessment Report

Hull Coating Leachate

Section 7- Overall Summary and Section 8 - References

August 2003

7 Overall Summary

As described in Section 1.1, Hull Coating Leachate is defined as “constituents that leach, dissolve, ablate, or erode from the paint on the hull into the surrounding seawater.” For the purpose of the UNDS analyses, only vessels with coatings that control fouling by marine organisms are included (i.e., antifouling and foul-release coatings). Vessels without coatings or with epoxy or urethane anticorrosive coatings are not included in the analyses. DoD has estimated that 3,104 Armed Forces vessels have antifouling coatings and contribute to the Hull Coating Leachate discharge worldwide.

The following three MPCD options passed the MPCD screening process and were examined in the environmental effects and feasibility impact analyses:

- Establish a Maximum Allowable Copper Release Rate for Antifouling Coatings,
- Foul-Release Coatings, and
- Advanced Antifouling Coatings.

Most Armed Forces vessels use copper-containing coatings. For the purposes of this analysis, the MPCD option to Establish a Maximum Allowable Copper Release Rate for Antifouling Coatings is anticipated to result in no immediate change to the release of constituents; however, over time, establishment of a maximum copper release rate may result in a reduction of environmental effects.

All vessels that produce the Hull Coating Leachate discharge were divided into three vessel groups to facilitate the environmental effects and feasibility impact analyses. The category with the largest wetted-hull surface area is the Steel, Composite, and Other Non-Aluminum Rigid Hulls vessel group, which includes most Armed Forces vessels. The second largest category is the Flexible Hulls vessel group, which consists of vessels that have hulls covered with flexible elastomeric materials. The third largest category is the Aluminum Hulls vessel group, which includes numerous classes of smaller vessels (e.g., 20-foot utility boats, 47-foot motor lifeboats, etc.) used by the Armed Forces.

The environmental effects, costs, and efficacy of the three MPCD options described above were analyzed for each of the three vessel groupings and the following summarizes these results:

- For the Steel, Composite, and Other Non-Aluminum Rigid Hulls vessel group, the MPCD option to Establish a Maximum Allowable Copper Release Rate for Antifouling Coatings was found not to have any impact on vessel operation and is anticipated to limit use of high copper release coatings in the future. The foul-release Coatings MPCD option showed that reductions in the copper discharge from the Steel, Composite, and Other Non-Aluminum Rigid Hulls vessel group was possible at an estimated cost of \$2,100 per toxic pound equivalent removed, but was considered to have significant feasibility impacts due to the limited service-life of the coating, the increased costs associated with hull cleaning, and potential adverse impact on military

specific operational requirements. The Advanced Coatings MPCD option analysis also showed a reduction in the number of BCCs identified and quantity of copper discharge from the Steel, Composite, and Other Non-Aluminum Rigid Hulls vessel group, but feasibility impacts similar to those described for foul-release coatings were identified.

- For the Flexible Hulls vessel group, the MPCD option to Establish a Maximum Allowable Copper Release Rate for Antifouling Coatings was found not to have any impacts on vessel operation. The foul-release coatings MPCD option was not analyzed for use on the Flexible Hulls vessel group, because performance validation testing would be required on an existing Navy nuclear submarine to ensure that damage would not occur to critical shipboard systems. Validation testing has not been done. Advanced antifouling coatings were also not analyzed for use on the Flexible Hulls vessel group, because advanced antifouling coatings have not been qualified to any Navy specification and all vessels with flexible hulls are operated by the Navy.
- For the Aluminum Hulls vessel group, advanced antifouling and foul-release coatings are currently used. The MPCD option to Establish a Maximum Allowable Copper Release Rate for Antifouling Coatings was not applicable to the Aluminum Hulls vessel group and as such was not analyzed. The foul-release coatings MPCD option resulted in environmental improvements, but potential adverse impacts on mission capabilities and maintenance activities were identified. The advanced antifouling coatings MPCD resulted in no environmental improvement.

8 References

- DSTO, 1995. *Media Release DSTO 22/95*. Defense Science and Technology Organization, Melbourne, Australia. 15 December 1995.
- Dust, 2003. Dust, Mark. Underwater Hull Paint Systems for Aluminum Vessels. Email response to A. Yue. 08 January 2003.
- EPA and Navy, 2000a. *Environmental Effects Analysis Guidance for Phase II Uniform National Discharge Standards for Vessels of the Armed Forces*. U.S. Environmental Protection Agency, Office of Water, Washington, DC, and U.S. Department of the Navy, Naval Sea Systems Command, Washington, DC. November 2000 (draft).
- EPA and Navy, 2000b. *Marine Pollution Control Device Screen Criteria Guidance*. U.S. Environmental Protection Agency, Office of Water, Washington, DC, and U.S. Department of the Navy, Naval Sea Systems Command, Washington, DC. November 2000 (draft).
- EPA and Navy, 2002a. *Hull Coating Leachate MPCD Screen, MPCD Option Group: Advanced Antifouling Coatings*. U.S. Environmental Protection Agency, Office of Water, Washington, DC, and U.S. Department of the Navy, Naval Sea Systems Command, Washington, DC. December 2002 (draft).
- EPA and Navy, 2003a. *Hull Coating Leachate MPCD Screen, MPCD Option Group: Establish a Maximum Allowable Copper Release Rate for Antifouling Coatings*. U.S. Environmental Protection Agency, Office of Water, Washington, DC, and U.S. Department of the Navy, Naval Sea Systems Command, Washington, DC. January 2003.
- EPA and Navy, 2003b. *Hull Coating Leachate MPCD Screen, MPCD Option Group: Foul-Release Coatings*. U.S. Environmental Protection Agency, Office of Water, Washington, DC, and U.S. Department of the Navy, Naval Sea Systems Command, Washington, DC. January 2003.
- EPA and Navy, 2003c. *Vessel Grouping and Representative Vessel Class Selection for Hull Coating Leachate Discharge*. U.S. Environmental Protection Agency, Office of Water, Washington, DC, and U.S. Department of the Navy, Naval Sea Systems Command, Washington, DC. January 2003 (draft).

- EPA and Navy, 2003d. *Hull Coating Leachate MPCD Screen, MPCD Option Group: Non-Coating Methodologies*. U.S. Environmental Protection Agency, Office of Water, Washington, DC, and U.S. Department of the Navy, Naval Sea Systems Command, Washington, DC. January 2003 (draft).
- Health Canada, 1994. *Regulatory Directive – Registration of Antifouling Coatings (Dir94-03)*. Health Canada, Pest Management Regulatory Agency, Ottawa, Ontario. March 30, 1994.
- Hempel. 2001. Hempasil SP-EED 77500 [product information]. Hempel Marine Paints A/S. February 2001.
- Holmdahl, 2000. Holmdahl, Olle. *COLLINS – A Contractor's Perspective*. Undersea Defense Technology Conference and Exhibition, Darling Point, Sydney, Australia. 7-9 February 2000.
- IMO, 2003. *Anti-fouling Systems*. International Maritime Organization Home Page. http://www.imo.org/Environmental/mainframe.asp?topic_id=223. Accessed 22 May 2003.
- Ingle, M. 2002. Antifouling Coatings Industry Status and Program Summary, U.S. Navy Briefing to the EPA. March 2002.
- International Coatings, 2000. *Antifoulings: The Legislative Position by Country*. International Coatings Ltd., November 2000.
- International Marine Coatings, 2001. Intersleek 700 [product information]. 2001. International Marine Coatings Home Page. <http://www.intersleek700.com/>. Accessed 25 April 2001.
- Jones, D.A. 1992. Principles and Prevention of Corrosion. Macmillan Publishing Company, New York, New York.
- Lamtec. 2001. Lamtec Corporation, Chemical Resistance of Polypropylene. <http://www.lamtec.com/corrosion.htm>. Accessed 11 February 2003.
- Lawrence, S. 2003. SN-1 NO FOUL. Email response to J. Tock. 21 February 2003.
- Marlin Paint. 2001. SIL-MAR [product information]. 2001. Marlin Paint Home Page. <http://www.marlinpaint.com/frame.html>. Accessed 25 April 2001.
- Mine. 2002. Mine Countermeasures Platforms and Systems Platforms Web Page. 9 April 2002. Chief of Naval Operations, Expeditionary Warfare. http://www.exwar.org/mwp/appendix_d2.htm. Accessed 18 April 2002.

- Navy, 2001. *MIL-PRF-246647C, Performance Specification: Paint System, Anticorrosive and Antifouling, Ship Hull*. Naval Sea Systems Command. Washington, DC. 24 September 2001.
- Navy and EPA. 1999. *Nature of Discharge Report: Hull Coating Leachate*. U.S. Department of the Navy, Naval Sea Systems Command, Washington, DC, and U.S. Environmental Protection Agency, Office of Water, Washington, DC, and April 1999.
- Navy and EPA, 2000. *Feasibility Impact Analysis Guidance Document for Phase II of the Uniform National Discharge Standards for Vessels of the Armed Forces*. U.S. Navy, Naval Sea Systems Command, Washington, DC and U.S. Environmental Protection Agency, Office of Water, Washington DC. April 2000.
- Navy and EPA, 2003a. *Characterization Analysis Report: Hull Coating Leachate*. U.S. Department of the Navy, Naval Sea Systems Command, Washington, DC, and U.S. Environmental Protection Agency, Office of Water, Washington, DC, and February 2003 (draft).
- Navy and EPA, 2003b. *Feasibility Impact Analysis Report: Hull Coating Leachate*. U.S. Department of the Navy, Naval Sea Systems Command, Washington, DC, and U.S. Environmental Protection Agency, Office of Water, Washington, DC, and February 2003 (draft).
- Navy and EPA, 2003c. *Environmental Effects Analysis Report: Hull Coating Leachate*. U.S. Department of the Navy, Naval Sea Systems Command, Washington, DC, and U.S. Environmental Protection Agency, Office of Water, Washington, DC, and May 2003 (draft).
- NRL, 1997. *Duplex Silicone Foul-Release Coatings*. U.S. Naval Research Laboratory, Environmental Quality Sciences, Chemistry Division, Washington, DC.
- Shimko and Tock, 2003. *MIL-P-15931 (Vinyl) Antifouling Coating Information*. Michael Shimko and John Tock, AMSEC LLC, Washington, DC. 3 April 2003.
- USCG, 2000. *Naval Engineering Advisory 6/00: Authorization of No Foul SN-1 for Aluminum Hull Underwater Body*. U.S. Coast Guard.
- USCG, 2001. *Coatings and Color Manual*. U.S. Coast Guard. COMDINST M10360.3B, June 12, 2001.